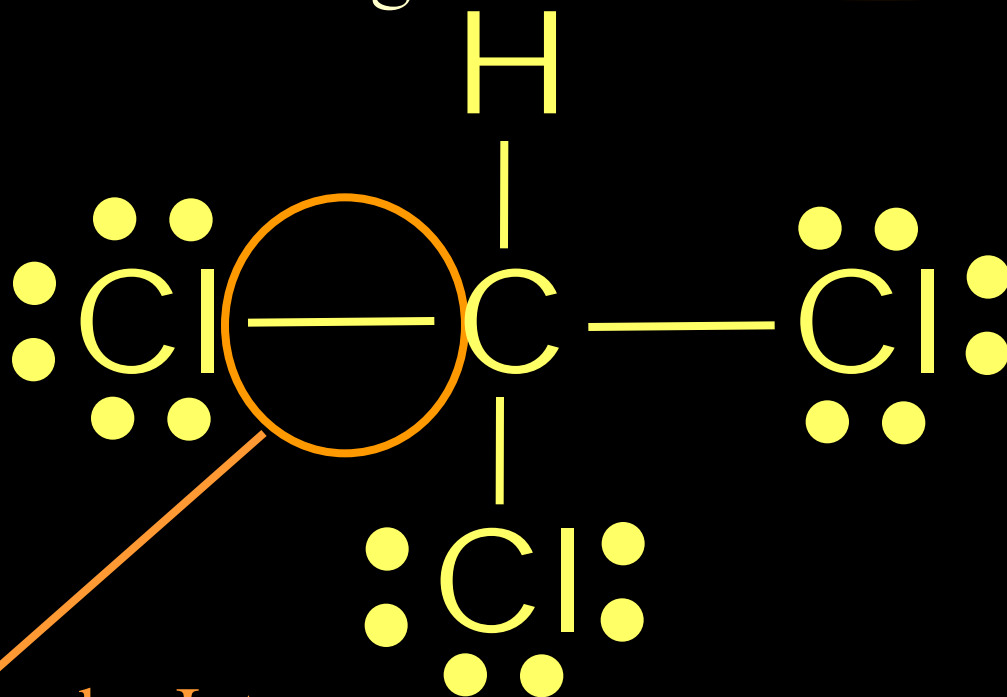


Intermolecular Forces of Attraction and Repulsion

Intra-molecular Forces

- Hold atoms together in a molecule



Covalent bond = Intra

Inter-molecular Forces



- Attractive forces between molecules.
- Interactions that are often caused by the polarity of molecules.
- Opposite charges (even partial charges) attract to each other

Types of Intermolecular Forces



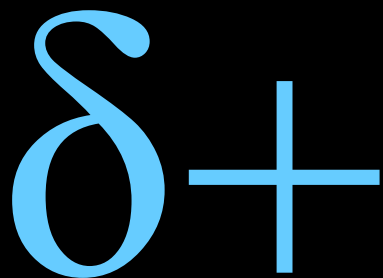
- Van der Waals forces
 - Dipole/Dipole
 - Dipole/Induced Dipole
 - Dispersion Forces
- Ion/Dipole
- Hydrogen Bonding (Dipole/Dipole)

Partial Charges — “delta ”

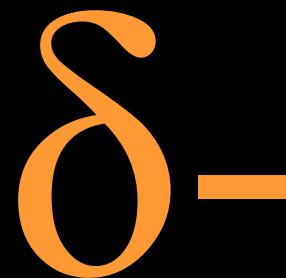


- Indicating a partial positive charge within a covalent compound, caused by a difference in electronegativity. POLARITY

Delta Positive

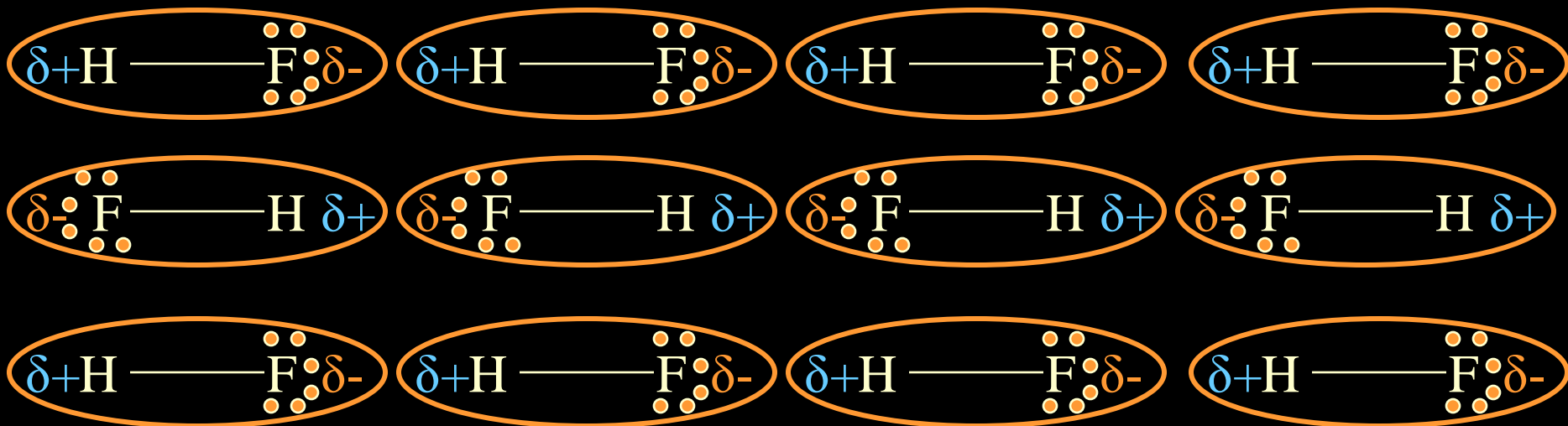


Delta Negative



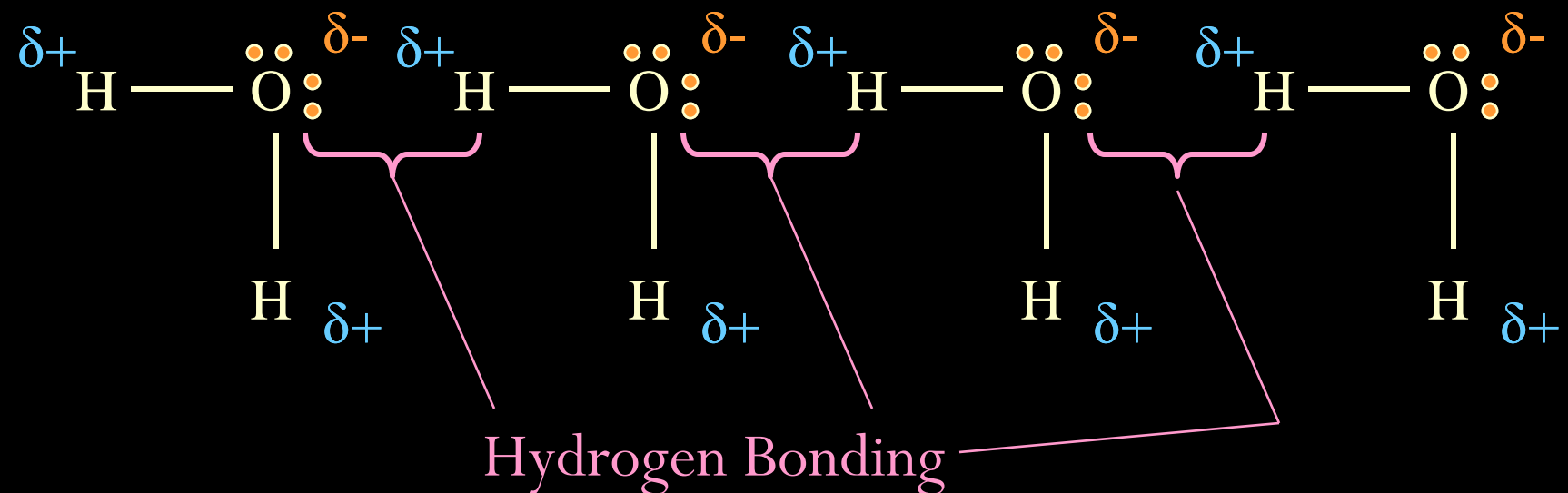
Dipole/Dipole Forces

- Attractive forces between polar molecules that possess dipole moments
 - Larger dipole moment = greater force of attraction

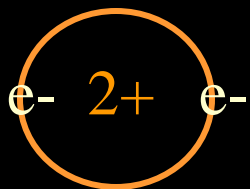
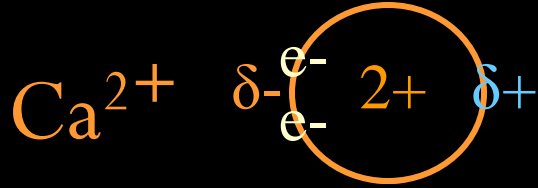
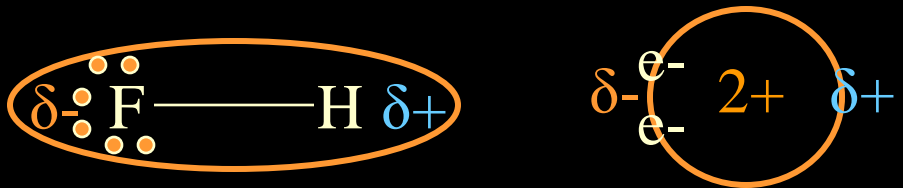


Hydrogen Bonding

- H-bonding is a special type of dipole-dipole interaction between a hydrogen atom in a polar bond (N-H, O-H, F-H) and an electronegative atom (N, O, F).

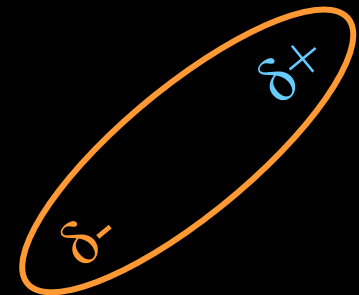
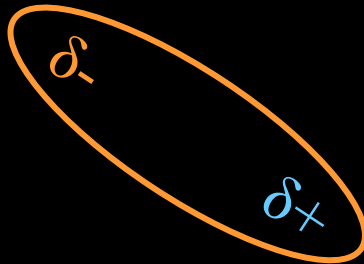
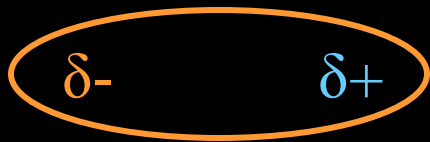
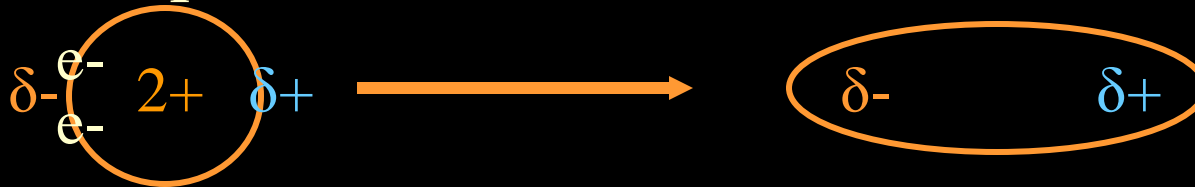


Induced Dipole

- The separation of positive and negative charges in the atom (or non-polar molecule) is due to the proximity of an ion or polar molecule
 - Polarizability
- Spherical charge distribution of Helium 
- Distortion caused by the approach of a cation 
- Distortion caused by the approach of a dipole 

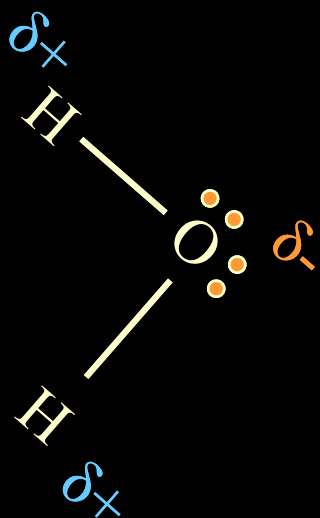
Dispersion Forces

- An induced dipole on one atom causes another induced dipole on a another near atom

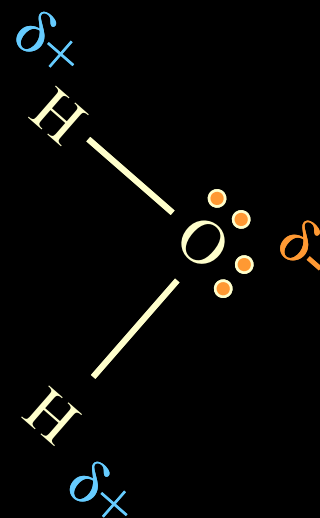


Ion / Dipole Forces

- Attraction of an ion (either cation or anion) and a polar molecule to each other.
- Strength depends on size and charge.



Weaker Interaction



Stronger Interaction

Which of the following can form hydrogen bonds with water?

- CH_3OCH_3
- CH_4
- F^-
- HCOOH
- Na^+

Strategy: A species can form hydrogen bonds with water if it contains one of the three more electronegative atoms (N,O,F) or it has H bonded to one of these three elements.

Exit Ticket



- Once again, complete a rough essay addressing Intermolecular forces this time. Make sure to include:
 - Each type
 - Examples
 - Diagrams
 - Complete on your own sheet of paper